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CAMPING ON THE SOUFRIÈRE OF ST. VINCENT.*

BY

EDMUND OTIS HOVEY.

One hundred miles due south of the crater of Mt. Pelé, Martinique, lies its associate in eruption, the great crater of the Soufrière of St. Vincent. This was the second main object† of my expedition to the West Indies in the spring of 1908 in behalf of the American Museum of Natural History, and, after five weeks in Martinique, my wife and I sailed for St. Vincent by way of Barbados and Grenada. It is not easy to get around from one island to another in the West Indies, especially between the French and the English colonies, and one's routes are often circuitous. We reached Kingstown, the capital and chief town of the island, an hour after sunset on June 15, and the next afternoon took the picturesque ride of about fourteen miles in the mail canoe along the leeward coast to the village of Château Belair, about a mile south of the limit of the actual devastation caused by the eruptions of 1902 and 1903.

St. Vincent is less than 18 miles long and 8 miles broad, but it is extremely mountainous, there being comparatively little flat land on the whole island. A continuous line of volcanic mountains, varying from 2,700 to more than 4,000 feet in altitude, runs from south to north and sends out great spurs to either coast. Those along the west coast have been cut off abruptly by the sea and present many bold bluffs to view, rendering the canoe ride extremely interesting, with a succession of fertile valleys opening into the interior giving glimpses of cultivated fields and great expanses of dense forests. Here and there a little village stretches along the coast or a "great house," with its attendant factory and hamlet, nestles among the cane, arrowroot or cotton fields of its plantation.

Camden Park, two miles from Kingstown, is one of the village sites purchased by the Colonial Government from the relief fund contributed by sympathizing friends all over the world and built up with cabins for the use of the negroes who were rendered homeless by the eruption. Layou, three miles beyond, is a village at the mouth of a valley that evidently was a favourite resort of the ancient Caribs, since many stone implements have been found here and a famous sacrificial stone covered with strange hieroglyphics is about a mile back from the coast. Three miles beyond Layou the canoe halts at the village of Barruali, quaintly placed on the coast at the base of a great cliff of columnar lava. The next stop is the end of the route, Château Belair, not a big place, but the most important town on the leeward coast. It lies upon an excellent harbour.

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† See BULLETIN, Nov., 1908, for account of the Martinique portion of the expedition.

Although so near the devastated zone, I begrudged the two miles intervening between Château Belair and the nearest part of my work on the Soufrière, hence, after two nights of camping out in the Government "rest room" in the police headquarters, we took our tents and other outfit in a canoe and established ourselves on a smooth little bench of new volcanic material beside the mouth of the Wallibou River at the base of the great Soufrière, not more than one hundred yards from a copious spring of delicious, pure water. It seemed an ideal place for a camp, but we had our periods of anxiety, since we were really too close to the bed of the Wallibou, a stream that is dry most of the time, but is subject to frequent floods, due to heavy rains on its mountain watershed, most of which is still practically barren of vegetation as a result of the eruptions.

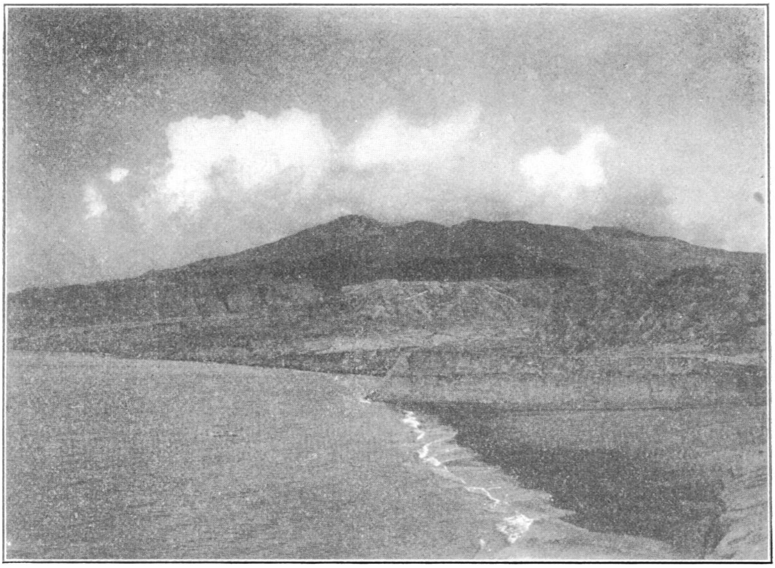

FIG. 1—THE SOUFRIÈRE OF ST. VINCENT.
MOUTH OF WALLIBOU RIVER IN FOREGROUND. MARCH, 1903.

The second day of our stay in camp we had a shower which can only be appreciated by those who have been in the tropics in the rainy season. For an hour or more the rain fell in sheets,—it simply seemed to come down solid water,—it poured. It was not long before the river appeared, coming down its bed in a roaring, sand- and boulder-laden wave, and in a very few minutes the sloping dry gravel plain, a fifth of a mile wide in front of our tent, was covered with a network of shallow channels which changed their locations with alarming frequency and quickness and threatened to undermine the little bluff on which our tent had been pitched. An extremely interesting feature of the flood was the way in which the water came down in waves or pulsations. During the most vigorous flow these waves were two feet high and only a few seconds apart. Perhaps they corresponded to the squalls of heavy downpour characterizing the rain storm, for the denuded watershed cannot hold back the water falling upon it to make the run off uniform. Boulders a foot or more in diameter were rolled swiftly along in these sand-saturated waves and carried long distances on the road to their final resting place, the sea. The flood subsided, however, without doing us any damage and did not rise again during our stay in camp, so that we had no further trouble on that score. With Camp Ws'libou as a centre, geological excursions were made in every direction, the most important of which, of course, were to the crater and the summit of the mountain.

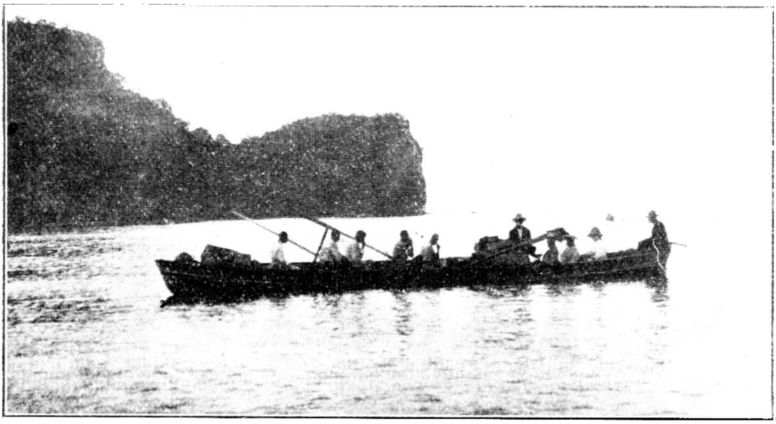

FIG. 2—BARRUALI MAIL CANOE "MIZPAH."

The ascent of the Soufrière of St. Vincent is one of the best, if not the very best, excursion in all the Lesser Antilles. The trail from the leeward is the most practicable route now. One follows the bed of the Trespé Dry River, close to the Wallibou, for three-quarters of a mile and then climbs sharply 300 feet upward to the north out of the river bed to gain the crest of the ridge which leads directly to the rim of the crater. Grass, bushes and young trees now cover the lower slopes of the mountain and render progress out of the valley somewhat uncomfortable, because the vegetation is tall enough to cut off the wind, but not tall enough to furnish any protection against the vertical rays of the tropical sun. The crest of the ridge, however, is comparatively free from vegetation, and after gaining it one has little trouble from that source, except for the vines which throw their creepers treacherously across the trail and trip the unwary traveller.

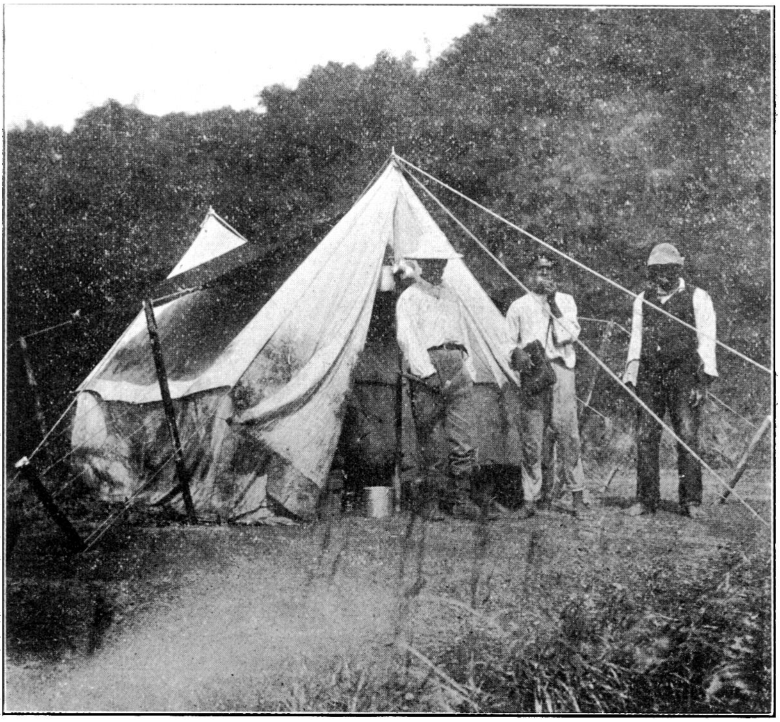

FIG. 3—WALLIBOU CAMP.
WALLIBOU BLUFFS IN BACKGROUND.

The trail itself is safe enough, but there are several places where one needs a steady head, for the path is barely six inches wide and the sides slope off rapidly, soon becoming precipitous. Progress is like walking the ridge-pole of a steeply pitched roof. About 1,500 feet above the sea the vegetation practically ceases, even grass being extremely scanty and small, and 200 feet higher the grass also fails except for widely scattered bunches The May, 1902, eruptions deposited enormous quantities of fine mud over the leeward side of the mountain, the coating being from three to six feet deep, even where no drifting took place. The October outbursts of the same year sifted sand and gravel over the mud. The loose stones remain on the surface between the altitudes of 1,000 and 2,000 feet, and make one's steps rather uncertain, but above 2,000 feet the well-compacted mud gives good foothold.

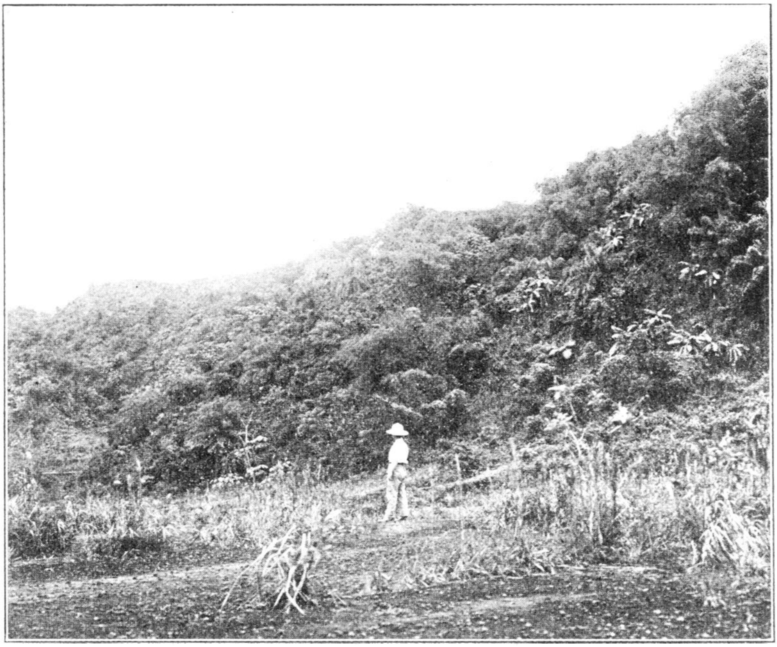

FIG. 4—BLUFF AT WALLIBOU CAMP.
SHOWS RENEWED VEGETATION ON A PROTECTED SLOPE.

Less than three hours after leaving the sea coast, on June 17, my wife and I stood on the rim of the crater at 3,013 feet above tide* and looked down into the wonderful open pit that forms the celebrated crater of the Soufrière. This is about nine-tenths of a mile in diameter from east to west and possibly 2,000 feet deep to the lake that occupies the bottom, estimating from the highest point of the rim, which is opposite the point where the leeward trail arrives at the crater's edge. As one stands at the point where the trail reaches the rim, he has the lake more than a quarter of a mile below him, surrounded by vertical and nearly vertical walls which render the water inaccessible to anything without wings. The walls consist of alternating beds of columnar lava and solidified ash, indicating the changes that have taken place in the activity of the volcano and the consequent upbuilding of the mountain.

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* British Admiralty chart of St. Vincent. Edition of 1890.

Prior to May, 1902, the Soufrière was noted for the beautiful lake of green water set like an emerald in the dark green of verdure-covered crater walls. The 1890 edition of the British Admiralty chart of the Island of St. Vincent gives 1,930 feet as the altitude above tide of the surface of the lake. Mr. P. F. Huggins, a native resident of St. Vincent, states* that he took soundings on visits to the bottom of the crater in 1896, 1898, 1899, and 1900, and found the water to be 87½ fathoms (525 feet) deep in the middle of the lake. This deep lake was thrown out by the eruptions and its place taken at a much lower level by a shallow pool of

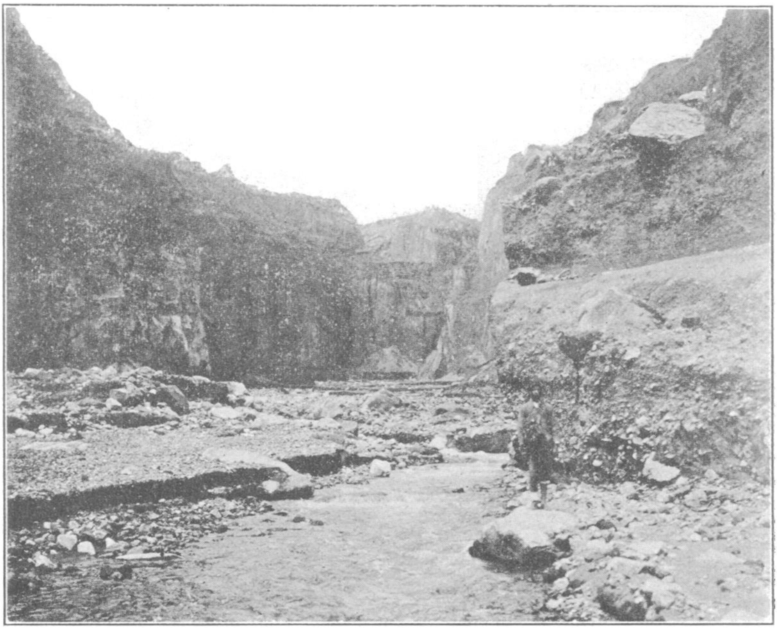

FIG. 5—WALLIBOU GORGE.
LOOKING UP STREAM TWO MILES FROM THE SEA.

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* An account of the Eruptions of the Saint Vincent Soufrière. 16mo, pp. 32, 2 pl. St. Vincent, 1902.

brown, muddy water, while the walls were completely denuded of vegetation. For about two years this pool was troubled with gentle puffs of steam or thrown out and destroyed by strong eruptions; but now the crater is perfectly quiet, not a wisp of steam being visible anywhere, and the lake has regained much of its former size and depth. The water is a beautiful yellowish green, varying in shade with the time of day and other accidents of light and shade. The walls give various tones of red, purple and gray, producing a marvellous setting to the green lake. A gale of wind was tearing over the mountain top at the rate of 60 to 75 miles an hour during our visit, much to our discomfort. The wind whistled over the rim of the crater and swirled down to its depths, lashing the waters of the lake into white-capped waves, or scurrying across the water in vicious whirlwinds that threw spray high into the air.

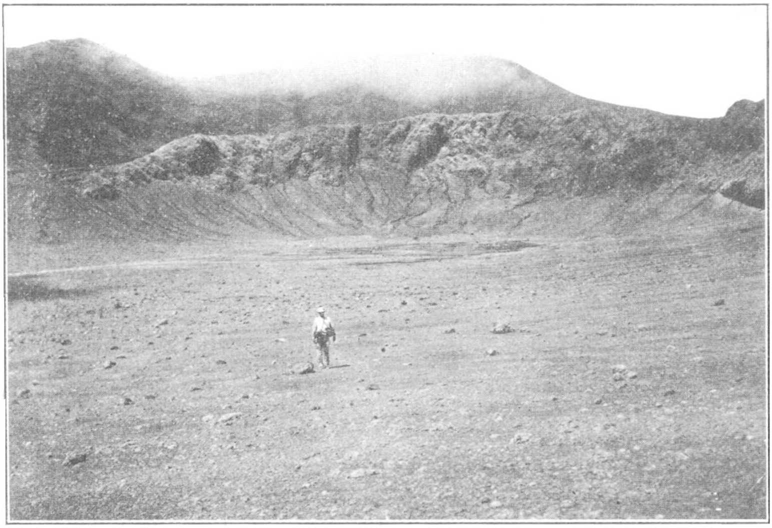

FIG. 6—THE "NEW" CRATER OF 1812.
NOW FILLED WITH ASH OF THE 1902 ERUPTIONS.

It is hard to say exactly what changes have taken place in the crater, since no accurate survey of it on a large scale was made before the eruptions began, and none has been made since. The appearance of the rim makes it seem probable that there has been no great change in its contour. Along the southern and south-western portions, sections show that a layer of fine ash, probably not more than six feet thick, has been added to its height. The south-eastern crest has lost by erosion much of the layer of new ash. There seems to be no indication of the thickness of the new material on the remainder of the rim. The interior of the crater has certainly been enlarged through widening due to the countless landslides resulting from the undermining action of the explosions and the stripping off of the old protective coat of vegetation. This widening has been most pronounced in the eastern half of the crater. The crater is thought also to have been deepened by the May, 1902, eruptions.

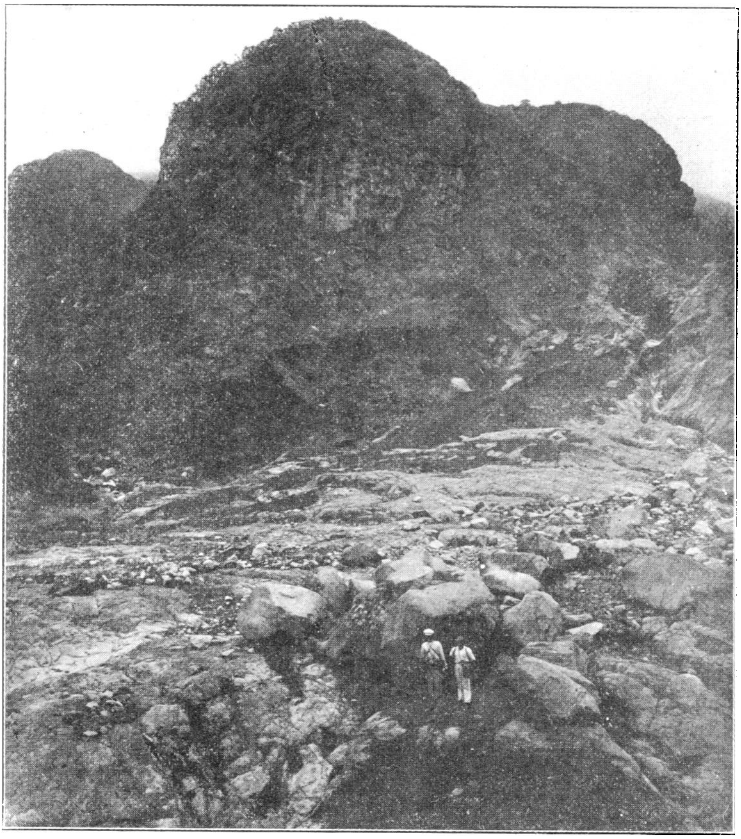

FIG. 7—WINDWARD TRAIL.
ROCK CROSSING AT 420 METERS, SHOWING BIG BOULDERS BROUGHT DOWN SINCE MARCH, 1903.

It was partly filled by the outbursts of October, 1902, but the débris was thrown out again by the more gentle activity of the succeeding months and the eruption of March, 1903, which was the latest great spasm, left it comparatively clean.

One of my desires was to see the windward or eastern side of the mountain and the island. I wanted to go over the top and down the old trail into the Carib Country, as the region north of Georgetown is called, but several experienced negroes at Château Belair said it was impossible. Only one man had made the trip across the mountain since the Rev. Thomas Huckerby and I had gone over in March, 1903, and this man had come over, three years ago, from Georgetown. The trail to windward was reported washed away for much of its course and deeply ravined. Not to be discouraged easily, I sent for James Jarvis, the colored man who went across with Mr. Huckerby and me five years ago, and asked him what he thought of the enterprise. He told me that he had not been over since he went with us, but that he was willing to make the attempt, since he thought the journey could be made.

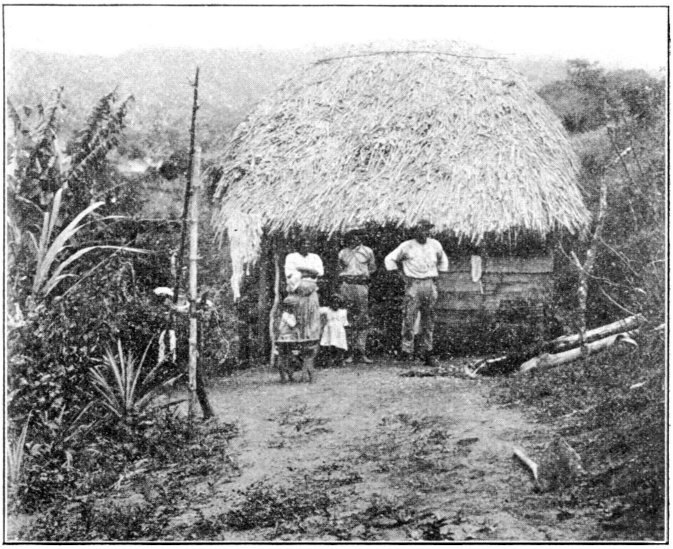

FIG. 8—NEGRO HUT.

The second porter was more difficult to find, and Jarvis approached five men before he was able to find one who was willing to accompany us, even at the more than triple wages I was ready to pay. One man had just hurt his foot, another did not see where he was going to get enough to eat, though I was responsible, of course, for their nourishment while on the expedition, and so on. The fact was that they were afraid to go, but I got my expedition organized in season and we left Château Belair at 6 o'clock on Wednesday morning, June 24, having broken camp the day before, since my work on the leeward side was finished.

The ascent from leeward was made without difficulty or incident, and when we reached the eastern side of the crater and had eaten our luncheon the clouds began to lift from the top of the mountain. Soon the whole summit was clear and I had a much-needed opportunity of examining the "new" crater, as it is called, which is the comparatively small vent that is said to have opened in the top of the mountain on the northeast side of the great crater during the eruption of 1812. The new crater has been two-thirds filled up with débris by the recent eruptions, and is now only about 50 feet deep below the lowest part of its rim. At 2:30 o'clock we began our descent to windward, and had to choose our way carefully, since no trace of the upper part of the trail remains. We found the right ridge directly and got along finely for the first thousand feet of descent, in spite of the loose stones and gravel covering the mountain side, which render footing uncertain.

About 2,000 feet above the sea the spur of our ridge, that we knew we ought to follow, dropped suddenly as a knife edge 250 feet into a great gorge. The ravine at the right proved to be impassable, ending at the same gorge in a precipice of 100 feet fall. The descent to the left looked almost as bad, on account of its steepness, but it was the only way, and down we started. This third attempt proved successful, projecting stones and convenient bushes, ferns and grasses enabling us to descend to the bed of the torrent across which the old trail went. My barometer gave the height of this almost vertical slope at 130 feet. Seeking to find an easier route than the farther side of the gorge offered, we descended the stream bed for some distance, only to find ourselves at the top of a sheer rock precipice at least 80 feet high.

Down or around this fall we could not go, hence we retraced our steps to a point near the place where we had succeeded in reaching the bottom of the gorge. Scaling the farther wall here, we found a few yards of the old trail along the side of the next ravine, but we could not follow its route on account of erosion, and we scrambled down to the stream bed. Here we got along very well and thought our difficulties conquered. Ten or fifteen minutes' walk showed us our error, for we came to the head of a series of precipices and gorges which were quite impassable. On the other side of the gorge we could see remnants of the old trail marked by a horizontal line of growing bamboos. We took courage then, for we were sure that there must be some way of reaching that path. Going back a quarter of a mile we plunged into a thicket of young trees, bushes and vines, now really dense and hard to penetrate, and after some hard, sharp work succeeded in finding the obscure and broken path which we had seen from a distance. This was indeed the old trail, and we soon reached the head of the ridge leading directly to the ruined Lot Fourteen estate and thence to our destination, the Orange Hill estate in the midst of the Carib Country.

This, the windward side of the Soufrière, in contrast with the leeward side, received only coarse material, coarse sand, gravel, cinders and bombs from the eruptions, and, although a larger area was seriously affected, the damage seems less likely to prove lasting. The deposit is more porous in character, hence it has not caked like the dust of the western side, but it has allowed water to penetrate to the old soil below and has not prevented vegetation from coming up through a coat of moderate thickness. This porosity of the deposit and the greater rainfall of the windward side have combined to cause vegetation to advance more rapidly than it has to leeward and the general appearance of the lower slopes of the mountain is one of verdure. Even 2,200 feet above the sea we found abundant grass, bushes and ferns. The northern slopes of the ancient crater wall around the northern part of the present crater were not scorched so badly, and they have recovered their old appearance. Close inspection, however, shows the black, cinder-like ash nearly everywhere on the ridges, though the slopes have been washed nearly clean by the rains of six wet seasons, and enormous quantities of ash have been carried down to the sea by the rivers, particularly the Rabaka.

The day after crossing the mountain was devoted to an inspection of the estates that were "devastated" by the eruptions. There were seven of these, almost entirely devoted to sugar cane and arrowroot, comprising about 3,500 acres of tillable land. This region was covered with from nine inches to three feet of new ash. Five of the estates, including about 2,500 acres, have been put back again for the most part into cultivation. One estate has not been touched, for lack of labourers, and the Lot Fourteen estate is practically abandoned, at least for the present, on account of the thickness of the coat of ash over most of it.

In St. Vincent the relief funds have been administered more judiciously than in Martinique and the planters have received some assistance in restoring their land to a productive condition. At the present writing (June, 1908) a canal is being constructed to bring water from Mt. Brisbane to five of the estates already mentioned for use in the sugar and arrowroot factories. The government has contributed $8,000 toward the cost of the undertaking, while the owner is paying the remainder of the expense, which will be $10,000 or $12,000 more.

The return trip to Château Belair was accomplished without difficulty. It was rendered interesting by a heavy rain squall striking the great crater while I was on the rim. The strong trade wind was blowing a gale as usual, bringing up the clouds in banks from the east-south-east. These curled over the eastern rim of the crater, dived into its depths, concealed the lake for a moment and then swept up and out into the Larikai Valley that descends precipitously to the sea on the west. A black rain cloud came up from the Atlantic and spread its thick mantle over the midday sun, making the crater a dismal abyss and doubling its apparent depth. The rain then fell in torrents, and was driven in sheets against the crater's walls by the fierce wind. The lake was beaten into foam by the thickly falling drops, and cascades drew many snow-white lines down the surrounding precipices. It was a weird and beautiful sight, soon over, but long to be remembered.

At present there is no sign of activity about the Soufrière, not a bit of stream or a fumarole or even a warm spring remaining as a witness of the violent eruptions that occurred so recently. It is not safe to make predictions about volcanoes, but that of St. Vincent seems to be sleeping again and perhaps has entered upon another 90-year period of repose. At any rate, the inhabitants rightly feel warranted in reclaiming such land as was not completely ruined by the eruptions, and they are pushing their cultivation forward season by season in the old regions.

THE DECLINE OF THE LUNAR DISTANCE FOR THE DETERMINATION OF THE TIME AND LONGITUDE AT SEA.

BY

G. W. LITTLEHALES.

In the March number of volume 44 of *Gaea* (1908), there appears an article, under the title "Der gegenwärtige Streit über die beste Methode zur Bestimmung der geographischen Länge auf dem Meere," which is of interest at the present time when the governments of the United States, Great Britain, and France have decided upon the elimination of the lunar-distance tables from the Nautical Almanacs published for the use of navigators. This account im-